## Claim Amendments:

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Currently amended) A method for modeling a reservoir system ~~using finite element techniques~~ comprising:

determining a property value of a physical property of at least one feature of a plurality of features of the reservoir system;

defining a plurality of finite element meshes, each finite element mesh associated with one feature of the plurality of features of the reservoir system, wherein a plurality of nodes are common to at least two finite element meshes of the plurality of finite element meshes;

defining a property representation associated with each finite element mesh of the plurality of finite element meshes, the property representation based on the property value of the physical property associated with the each finite element mesh, wherein for each finite element mesh of the plurality of finite element meshes, the property representation is defined by a corresponding function which is independent of other functions associated with the physical property and associated with other finite element meshes;

associating an evaluator with each finite element mesh of the plurality of finite element meshes; and

generating a ~~solution~~ representation of the reservoir system based ~~for~~ each finite element mesh of the plurality of finite element meshes, wherein for each finite element mesh of the plurality of finite element meshes, the function used to define the ~~value of the~~ property representation at each of the common nodes is selected according to the evaluator associated with the each finite element mesh.

2. (Currently amended) The method of claim 1 wherein defining the plurality of finite element meshes comprises defining ~~all~~ nodes on a ~~boundaries~~ boundary between the at least two finite element meshes to be common to the at least two finite element meshes which touch the corresponding ~~boundaries~~ boundary.

3. (Currently amended) The method of claim ~~1~~2 wherein at least one node which lies on ~~one of~~ the ~~boundaries~~ boundary between the at least two finite element meshes is not common to ~~all of~~ the at least two finite element meshes which touch the corresponding boundary.

4. (Currently amended) The method of claim 1 wherein the ~~each function is distinct from the other functions~~ the physical property is permeability or porosity.

5. (Currently amended) The method of claim 4 wherein at least two of the functions associated with the physical property are not continuous with each other.

6. (Currently amended) The method of claim 1 wherein the reservoir system is an oil reservoir, wherein one finite element mesh of the plurality of finite element meshes corresponds to a first portion of the oil reservoir and another of the finite element meshes corresponds to a feature ~~within the oil reservoir, and wherein the feature is~~ selected from the group consisting of~~:~~ a fracture; a completion zone; a damage zone; a geological stratum; and a near well region.

7. (Original) The method of claim 1 wherein defining the plurality of finite element meshes comprises defining a plurality of two-dimensional finite element meshes and extruding the two-dimensional finite element meshes in a third dimension to obtain three-dimensional finite element meshes.

8. (Currently amended) The method of claim 1 wherein defining the plurality of finite element meshes comprises defining a first finite element mesh to include both a first region and a second region corresponding to the ~~modeled~~ reservoir system, refining the first finite element mesh to carve out the second region, and defining a second finite element mesh within the second region.

9. (Original) The method of claim 8 wherein refining the first finite element mesh to carve out the second region comprises defining a boundary surface between the first region and the second region, adapting the first finite element mesh to define elements having surfaces which lie substantially on the boundary surface, defining the first finite element mesh as the

elements on a first side of the boundary surface and defining the second finite element mesh as the elements on a second side of the boundary surface.

10. (Currently amended) The method of claim ~~1~~9 wherein adapting the first finite element mesh comprises identifying intersections of edges of the elements of the first finite element mesh with the boundary surface, defining nodes at the identified intersections, and refining the elements of the first finite element mesh to incorporate the newly defined nodes.

11. (Currently amended) A method for ~~modeling~~ representing ~~an oil~~ a reservoir ~~using finite element analysis~~, wherein the reservoir has a plurality of adjoining regions corresponding to the reservoir and one or more features within the reservoir, wherein each of the regions is characterized in a corresponding finite element model, and wherein for a selected physical property of the reservoir each finite element model employs an independent function to represent the selected physical property, ~~wherein~~ the method ~~comprises~~ comprising:

determining a property value of the selected physical property for each region of the plurality of regions;

associating an evaluator with each ~~of the~~ finite element model~~s~~; and

generating a solution for each ~~of the~~ finite element model~~s~~; wherein generating the solution comprises calculating a solution based on the value of the independent function representing the selected physical property at each of the nodes in the each finite element model, wherein for each of one or more nodes which lie on boundaries between the each finite element model being solved and one or more other ~~of the plurality of~~ finite element models, the value ~~for the selected property~~ is dependent upon the evaluator associated with the each finite element model being solved.

12. (Original) A computer readable medium containing instructions which are configured to cause a computer to perform the method comprising: defining a plurality of finite element meshes, wherein a plurality of nodes are common to at least two of the finite element meshes; defining a property associated with each of the finite element meshes, wherein for each of the finite element meshes, the

property is defined by a corresponding function which is independent of the other functions; associating an evaluator with each of the finite element meshes; and generating a solution for each of the finite element meshes, wherein for each of the finite element meshes, the function used to define the value of the property at each of the common nodes is selected according to the evaluator associated with the finite element mesh.

13. (Original) The computer readable medium of claim 12 wherein defining the plurality of element meshes comprises defining all nodes on boundaries between the finite element meshes to be common to the finite element meshes which touch the corresponding boundaries.

14. (Original) The computer readable medium of claim 12 wherein at least one node which lies on one of the boundaries between the finite element meshes is not common to all of the finite element meshes which touch the corresponding boundary.

15. (Original) The computer readable medium of claim 12 wherein the each function is distinct from the other functions.

16. (Original) The computer readable medium of claim 15 wherein at least two of the functions are not continuous with each other.

17. (Original) The computer readable medium of claim 12 wherein one of the finite element meshes corresponds to a first portion of an oil reservoir and another of the finite element meshes corresponds to a feature within the oil reservoir, and wherein the feature is selected from the group consisting of: a fracture; a completion zone; a damage zone; a geological stratum; and a near well region.

18. (Original) The computer readable medium of claim 12 wherein defining the plurality of finite element meshes comprises defining a plurality of two-dimensional finite element meshes and extruding the two-dimensional finite element meshes in a third dimension to obtain three-dimensional finite element meshes.

19. (Original) The computer readable medium of claim 12 wherein defining the plurality of finite element meshes comprises defining a first finite element mesh to include both a first region and a second region corresponding to the modeled system, refining the first finite element mesh to carve out the second region, and defining a second finite element mesh within the second region.

20. (Original) The computer readable medium of claim 12 wherein refining the first finite element mesh to carve out the second region comprises defining a boundary surface between the first region and the second region, adapting the first finite element mesh to define elements having surfaces which lie substantially on the boundary surface, defining the first finite element mesh as the elements on a first side of the boundary surface and defining the second finite element mesh as the elements on a second side of the boundary surface.